CHAPTER 4.0 - METHODOLOGY FOR DREDGING PLANT AND MARINE EQUIPMENT

SECTION I. GENERAL

4.1 Contents

This chapter contains the methodology used to compute ownership and operating rates for dredging plant and permanent floating plant such as floating pile-driving equipment. Dredging plant is marine equipment used for dredging operations for the majority of its life or designed and built for marine/dredging use.

4.2 General

a. The ownership and operating rates provided in table 2-1, category M-10, are based on the methodology in chapter 2 for nondredging equipment. However, the cost data (Acquisition Cost, Horsepower, and Fuel Type) may be used for calculation of dredging plant and marine equipment rates, provided they are calculated in accordance with the methodology provided in this chapter.

b. Table 4-1 shows ownership and operating cost factors for various types of dredging plant. When a type of plant is not listed, the cost is estimated by using the factors listed in this table for a similar type of plant.

c. The methodology for determining operating rates for hopper dredges was omitted from this pamphlet due to the limited number of hopper dredges and the complexity of the methods used to calculate the rates. Further information on hopper dredges can be found in Engineer Regulation (ER) 1110-2-1302, *Engineering and Design, Civil Works Cost Engineering*, and on the Internet at http://www.usace.army.mil/inet/usace-docs/eng-regs/er1110-2-1302/toc.htm. The methodology for calculating ownership cost is in section V of this chapter.

d. For mechanical dredges, the cost of the bucket is typically included in the plant value; therefore, no additional allowance should be made for ownership cost. If the bucket cost is not included in the plant value, the bucket may be treated as a separate unit of equipment.

SECTION II. ANNUAL USE

4.3 Time Available to Dredge

a. The number of months available per calendar year (yr) for dredging shall be based on the work time available to dredge, excluding downtime for major repairs, work in dry dock, bad weather, and environmental restrictions. Figure 4-1 depicts months available for dredging, including mobilization and demobilization, based on historic data collected by the U.S. Army Corps of Engineers' regional dredge estimating teams.

The data in figure 4-1 shall be used for computing the ownership costs unless specified otherwise in the contract documents.

AVAILABLE TIME TO DREDGE BY REGION
(In Months)

Region	Type of Dredging Operation		
	Pipeline	Bucket	Hopper
Atlantic Coast and tributaries	9	10	10
Gulf Coast, Lower Mississippi, and Tributaries	10	10	11
Great Lakes, Upper Mississippi, and Tributaries	8	8	8
West Coast and Tributaries	9	9	9

Figure 4-1. Months Available by Region

SECTION III. LIFE

4.4 Life

The life for determining ownership and operating costs is defined as follows:

a. The Useful Life is expressed in years in table 4-1. It is the economic life of the equipment and is used to develop ownership rates for various types of dredging plant.

b. The Physical Life is expressed in hours (hrs) in table 4-1. It is the life of the unit based on effective working time and is used to develop operating rates for various types of dredging plant.

4.5 Annual Hours Available

The annual hours available to dredge can be established for each type of plant based on the months available and the estimated effective monthly hours worked. Dredging time is defined as effective plus noneffective working time. “Effective working time" is defined as time during the dredging operation when actual production is taking place. "Noneffective working time" is defined as time during the dredging operation when the dredge is operational but no production is taking place. For complete definition of terms see ER 1110-2-1302*, Engineering and Design*, *Civil Works Cost Engineering.* The total annual hours available can be expressed by formula, as follows:

Available Hours per yr = Months Available/yr x Effective Hours/Month

Where:

- Months Available/yr is found in figure 4-1.
- Effective Hours/Month is the effective working time.

SECTION IV. SALVAGE VALUE

4.6 Salvage Value (SLV)

The salvage value, expressed as a decimal, is shown in table 4-1 for different types of plant.

SECTION V. OWNERSHIP COST

4.7 Ownership Cost

Ownership cost is calculated based on a percent of plant value. Plant value is the acquisition cost plus the cost of any initial capital improvements. The value of initial capital improvements is based on those betterments, which were made within 1 year of purchase. Capital improvements do not include any replacement or repair work. Repairs or replacements are an operating cost and are covered in the repair cost allowance. Capital improvements are considered betterments, where the plant has been improved (*e.g.,* adding radar or upgrade of engines). (Note: Only the cost difference between replacement of existing similar engines and actual cost for upgrading engines should be considered as capital improvement). For capital improvements not made within the first year after the initial acquisition, see section VIII.

a. The ownership cost is determined from the plant value and is the total expense rate based on depreciation and CMR. When cost or pricing data is available, the actual acquisition price shall be used. Otherwise, the value of a similar piece of plant is used and, if necessary, adjusted so that capacity, size, and horsepower are properly considered.

b. Ownership rate is determined on a yearly basis and distributed over a monthly basis. The monthly rate is calculated based on the available use months by using the following formula:

$$\text{Monthly Ownership Cost} = \frac{\text{Plant Value x (Yearly DEPR Percent} + \text{Yearly CMR Percent)}}{\text{Available Use Months}}$$

Where:

- Plant Value = Acquisition price plus initial capital improvements.
- Yearly DEPR Percent = Ownership percent per year for depreciation.

- Yearly CMR Percent = Ownership percent per year for cost of money rate.
- Available Use Months is from figure 4-1.

4.8 Depreciation Factor

Depreciation is computed using the straight-line method. The depreciable value is the acquisition cost, plus initial capital improvements, less estimated salvage. The basis for determining the yearly percentage factor for depreciation is expressed by the following formula:

$$\text{Yearly DEPR Percent} = (1 - \text{SLV}) / \text{N}$$

Where:

- N = Useful Life from table 4-1.
- SLV = Salvage Value from table 4-1.

4.9 The Cost of Money Rate (CMR) Factor

The CMR factor is calculated on a yearly basis and is expressed here as an annual percentage factor. The CMR used in the calculation is the rate in effect at the time the work was performed. This formula is expressed as follows:

$$\text{Yearly CMR Percent} = \frac{[(\text{N} - 1)(1 + \text{SLV}) + 2](\text{discounted CMR})}{2\text{N}}$$

Where:

- N = Useful Life from table 4-1.
- SLV = Salvage Value from table 4-1.
- Discounted CMR = Cost of money rate (appendix I) reduced by 25 percent for overhead and profit allowance.

4.10 Other Ownership Elements

Taxes, storage (lay up), and insurance are considered indirect (overhead) costs as defined in ER 1110-2-1302, appendix D. These costs are not included in ownership rates since they vary by geographic area and with individual contractors. These costs are considered as overhead costs and are, therefore, not included here so they will not be duplicated in the overhead in the estimate or submitted proposal.

SECTION VI. OPERATING FACTORS

4.11 Hourly Operating Cost

Operating cost is based on effective working time. Dredging plant operating factors are shown in table 4-1. These factors, which are described in paragraph 4.12, are not intended to replace historical data but shall be used when historical data is limited or nonexistent.

4.12 Prime and Secondary Power

Prime power refers to the primary operating engine for the dredge or other piece of attendant plant. Secondary power refers to all other secondary engines or power plants. If more than one secondary power engine is present, the horsepower is totaled. Fuel consumption factors are prepared on the same basis as in chapter 2. Hourly fuel costs are calculated separately for the primary and secondary engines. The formula used is expressed as follows:

Hourly Fuel Cost = Horsepower x Fuel Cost/Gallon x Engine Fuel Factor

Where:

- Horsepower is the engines rated horsepower.
- Fuel Cost/Gallon is based on values shown in appendix B. See chapter 3 for fuel cost adjustments.
- Fuel Factor - Gas or Diesel Fuel. The fuel factor is listed in table 4-1 for the primary and secondary engines.

4.13 Water, Lube, and Supplies (WLS)

This factor is similar to the filters, oil, and grease (FOG) factor described in chapter 2. This item is computed as either a percentage of the hourly fuel costs or, if the type of plant has no engine, a reasonable hourly cost should be included.

This factor does not include an allowance for the oiler normally assigned to the dredge or other piece of dredging plant. The formula is expressed as follows:

Water, Lube, and Supply Cost = WLS factor x Hourly Fuel Cost

Where:

- WLS Factor is obtained from table 4-1.
- Hourly Fuel cost is calculated as shown in paragraph 4-12.

4.14 Repairs (RPR)

This factor includes an allowance for all major and minor repairs and is similar to the maintenance and repair cost factor (RCF) described in chapter 2. The economic

adjustment factor (EAF) and the labor adjustment factor (LAF) are required to develop this cost. The formula is expressed as follows:

$$\text{Repair Cost} = \frac{\text{(Total Plant Value x RPR x EAF x LAF)}}{\text{Life in hr}}$$

Where:

- Total Plant Value = Acquisition price plus Initial capital improvements.
- RPR = Repair Factor from table 4-1.
- EAF = Economic Index (present year)/ Economic Index (acquisition year).
- LAF = Labor Adjustment Factor from appendix B.
- Life in hrs = Physical Life from table 4-1.

It should be noted that the repair allowance does not include the following estimated additive items:

a. Excessive dredge wear for parts (*e.g.,* cutter teeth and main suction pumps) is not included due to the wide variety of materials being dredged. The original cost of the bucket and normal wear are typically included in the plant value covered in the plant rate. Excessive bucket wear for mechanical dredges is estimated as an additive item or treated as a separate unit of equipment from table 2-1. Allowances for wear due to abrasive material should only be included as an additive item if it is warranted and is not considered elsewhere in the estimate.

b. Dry docking costs, which represent an allowance for rental of the dry dock facility, are not included because they vary greatly depending on the facilities available. Repairs incurred while in dry dock, which occur periodically, are in the repairs. Dry docking costs will be allocated on an average annual basis over the years between such occurrences in accordance with Cost Accounting Standards and Generally Accepted Accounting Practices.

c. There is no predetermined allowance in the dredging plant methodology for jobsite yard costs, mobilization, or demobilization. All of these cost elements must be separately estimated to match each project's construction conditions.

SECTION VII. STANDBY

4.15 Standby Rate

The standby rate is computed by allowing the full ownership cost. In addition to the standby ownership rate, it may be necessary on dredges to include operating costs. Examples of allowable operating cost are as follows: a generator fuel allowance to account for operation of a diesel engine generator for power to operate pumps; navigation lights; minimum crew; *etc*.

a. Standby is a directed delay by the Government and will not be allowed during periods when the plant would have otherwise been in idle status, such as noneffective working time. Since ownership is calculated based on life in years computed monthly, standby should be paid only when additional time has been directed by the Government. Standby is to be paid on a 24-hour basis.

b. Standby for pipeline and accessories shall be based on pumping mud in determining values from table 4-1.

SECTION VIII. NEGOTIATED PROCUREMENT

4.16 Rates

The calculated dredging plant rates based on the methodology presented in this chapter should be used for preparing a reasonable contract estimate. When adequate cost or pricing data is available and submitted by the contractor for negotiated procurement, the rates may be adjusted in accordance with the methodology in this chapter. Cost or pricing data is defined in FAR 15.4*, Contract Pricing*.

4.17 Allowance for Additional Capital Improvements

Allowance for additional capital improvements shall be calculated in accordance with accepted general accounting principles. When adequate cost or pricing data is not available, factors for a similar unit of equipment may be used for determining the ownership rate for overage equipment and plant.

4.18 Overage Plant

When the plant has exceeded the useful life given in table 4-1, it is considered overage. The ownership rate for overage plant should be determined with the same methodology described in section V.

a. When actual cost or pricing data is available to adjust the operating rate, the data must be accurate, complete, and established in accordance with accepted general accounting principles.

b. When actual cost or pricing data is not available, the total hourly operating rate for overage equipment shall be computed on the basis that the equipment is equal to the useful life as shown in table 4-1.

4.19 Dredging Plant Purchased Used

For plant purchased used, the ownership and operating rate must be calculated on an individual case, due to the varying conditions. When actual cost or pricing data is not available, the methodology from this chapter shall be used and values for life and salvage from table 4-1 can be adjusted. Support for adjustments can be obtained by calling the Chief, Cost Engineering Branch, Engineering and Construction Division,

Walla Walla District, U.S. Army Corps of Engineers (CENWW-EC-X), telephone 509-527-7511 or 509-527-7510.

SECTION IX. RATE CALCULATION EXAMPLE

4.20 Rate Calculation Example

The example shown in figure 4-2 illustrates the use of figure 4-1, table 4-1, and the regional data from appendix B to generate a rate. For illustration purposes, assume that a 24-inch hydraulic dredge (pipeline) was purchased new in 1991 for $3,700,000, including tax and delivery, and there were no initial capital improvements. This example uses 500 hours per month and a discounted CMR of 4.20 percent.

Table 4-1. Dredging Plant Cost Factors

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
Hydraulic Dredges - Pipeline (Cutterhead or Dustpan) (Based on Discharge Diameter) (Non-Truckable)												
8 inch and under	5	10,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	70
9 inch through 10 inch	6	12,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	80
11 inch through 12 inch	8	16,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	90
13 inch through 15 inch	15	40,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	100
16 inch through 17 inch	20	80,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	110
18 inch through 20 inch	20	100,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	120
21 inch through 22 inch	25	120,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
23 inch through 24 inch	25	130,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
25 inch through 29 inch	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
30 inch or larger	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
Barge Mounted Booster Pump (For Pipeline Dredges)												
16 inch through 17 inch	20	80,000	0.05	80	0.083	0.045	70	0.072	0.039	22	24	80
18 inch through 20 inch	20	100,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	90
21 inch through 22 inch	25	120,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	100
23 inch through 24 inch	25	130,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	110
25 inch through 29 inch	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	120
30 inch or larger	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	120

SLV = Salvage Value HPF = Horsepower Factor G = Gas D = Diesel
WLS = Water, Lube and Supplies RPR = Repairs

Table 4-1. Dredging Plant Cost Factors (Continued)

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
Mechanical Dredges (Large)[1]												
Clamshell - under 5 cy	8	18,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	90
Clamshell - 6 cy to 10 cy	13	26,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	100
Clamshell - 11 cy to 15 cy	20	40,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	110
Clamshell - 16 cy to 20 cy	25	75,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	120
Clamshell - 20 cy and over	30	90,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	130
All Other Types (Bucket or Dipper)	25	90,000	0.10	70	0.072	0.039	60	0.062	0.033	22	24	120
Barge Mounted Crane with Clamshell Bucket Non - Dredging												
Clamshell - under 6 cy	9	18,000	0.05	55	0.055	0.031	45	0.045	0.025	22	24	85
Clamshell - 6 cy to 10 cy	14	28,000	0.05	55	0.055	0.031	45	0.045	0.025	22	24	95
Clamshell - 11 cy to 15 cy	21	42,000	0.05	55	0.055	0.031	45	0.045	0.025	22	24	105
Barge Mounted Lifting Crane												
25 Ton to 75 Ton, 45' Boom	9	18,000	0.05	40	0.040	0.022	30	0.030	0.017	22	24	80
75 Ton to 125 Ton, 60' Boom	14	28,000	0.05	40	0.040	0.022	30	0.030	0.017	22	24	90
Over 125 Ton, over 60' Boom	21	42,000	0.05	40	0.040	0.022	30	0.030	0.017	22	24	100
Barges (Used with Dredging)												
Fuel or Water	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Equipment or Work	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Derrick	20	90,000	0.10	20	0.021	0.011	20	0.021	0.011	18	20	70
Anchor	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Mooring Barge	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Dump Scow	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	70

SLV = Salvage Value HPF = Horsepower Factor G = Gas D = Diesel
WLS = Water, Lube and Supplies RPR = Repairs
[1] Sized by the largest bucket used (normally a mud bucket)

Table 4-1. Dredging Plant Cost Factors (Continued)

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
Boats – See Category M10.50												
Tugs and Tenders (Used with Dredging)												
Under 500 hp	8	18,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	80
501 through 1,000 hp	10	40,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	90
1,001 through 2,000 hp	15	55,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	100
2,001 through 3,000 hp	20	100,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	110
Over 3,000 hp	25	120,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	120
Pipeline and Accessories (Inland Environment)												
Metal Pipeline (under 20 inch)												
Pumping Mud	2	9,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1	4,500	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.3	1,500	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Joints	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	30
Pontoons/Floats	12	60,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Metal Pipeline (20 inch and Larger)												
Pumping Mud	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1.5	6,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.5	2,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Joints	3	12,00	0.10	0	0.000	0.000	0	0.000	0.000	0	0	30
Pontoons/Floats	12	60,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5

SLV = Salvage Value HPF = Horsepower Factor G = Gas D = Diesel
WLS = Water, Lube and Supplies RPR = Repairs

Table 4-1. Dredging Plant Cost Factors (Continued)

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
Pipeline and Accessories (Ocean Environment)												
Metal Pipeline (All sizes)												
Pumping Mud	2	9,000	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1	4,500	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.3	1,500	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Joints	1	4,500	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Pontoons/Floats	2	9,000	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Metal Pipeline On-Shore												
Pumping Mud	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1.5	6,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.5	2,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5

Standby Calculation: Standby for pipeline and accessories shall be based on pumping mud.

SLV = Salvage Value HPF = Horsepower Factor G = Gas D = Diesel
WLS = Water, Lube and Supplies RPR = Repairs

Example: *The piece of equipment shown is based on a known piece of equipment for illustration purposes only.*

USE THIS WORKSHEET TO COMPUTE A MONTHLY AND HOURLY RATE FOR MARINE AND DREDGING PLANT

Region 04 **ID No:** _____

1. MARINE AND DREDGING PLANT INFORMATION AND EXPENSE FACTORS

a.	Plant Pertinent Data:		
(1)	Equipment Description:	24" Hydraulic Cutter Suction Dredge	
(2)	Model and Series:	Ellicott Series 4900 Super Dragon	
(3)	Present Year or Year of Use:		2007
(4)	Acquisition Year:		1991
(5)	Horsepower (hp) - Prime		3,730 hp
(6)	Horsepower (hp) - Secondary Engine (s):		
	(a) Electrical Generators		200 hp
	(b) Hydraulic System		1,325 hp
	(c) Cutter Head Drive		750 hp
	(d) Hydraulic Water Jet		200 hp
	Total Secondary hp		**2,475 hp**
(7)	Plant Value:		
	(a) Acquisition Costs		$3,700,000
	(b) Capital Improvements		$0
	Total Plant Value		**$3,700,000**
(8)	Hours Worked per Month (Effective Time)		500 hrs/mo
(9)	Additive Item(s) (Monthly Costs To be Estimated)		
	(a)	Excessive Dredge Wear (Gravel)	$8,000 /mo
	(b)		$0 /mo
	(c)		$0 /mo
	(d)		$0 /mo
	(e)		$0 /mo
	Total Additive Items		**$8,000 /mo**
b.	Appendix B, Area Factors Data		
(1)	Labor Adjustment Factor (LAF)		1.08
(2)	Fuel type		Marine Diesel
	Fuel Cost Per Gallon		$2.50
(3)	Cost of Money Rate (undiscounted)		5.25%
(4)	Cost of Money Rate (discounted)		4.20%
c.	Appendix E, Economic Index Data (EK 105)		
(1)	Economic Index, Acquisition Year		4438
(2)	Economic Index, Present Year or Year of Use		7221

Input data, methodology and notes used in the following sections of this form are or have reference to EP 1110-1-8, CONSTRUCTION EQUIPMENT OWNERSHIP AND EXPENSE SCHEDULE (see chapter 4).

Figure 4-2. Dredging Plant Ownership and Operating Rate Worksheet **Page 1 of 4**

Region 04

1. MARINE AND DREDGING PLANT INFORMATION AND EXPENSE FACTORS (Continued)

d. Figure 4-1, Available Time to Dredge By Region Data (See Chapter 4, paragraph 4.3 for guidance)

(1) Months Available Per Year *(9 months is used for this example)*	9 months/yr

e. Table 4-1, Dredging Plant Cost Factors Data

(1)	Useful Life (in Years) for Ownership (N)	25 yrs
(2)	Physical Life (in Hours) for Repairs	130,000 hrs
(3)	SLV (Salvage Value Factor)	0.10
(4)	Prime Engine Fuel Factor (gal/bhp-hr)	0.045
(5)	Secondary Engine Fuel Factor (gal/bhp-hr)	0.039
(6)	WLS (Water, Lube & Supplies Factor) percent	22%
(7)	RPR (Repair Cost Factor)	1.30

2. ANNUAL OWNERSHIP PERCENTAGE FACTORS

a. Depreciation Percent Per Year (DEPR)

(1.0 - SLV)	/	(N)		
1.e.(3)		1.e.(1)		
(1.0 - 0.10)	/	(25 yrs)	=	3.60% /yr

b. Facilities Capital Cost of Money Percent Per Year (FCCM)

				(Discounted Money				
[(N-1)	x	(1+SLV)+2]	x	Rate)	/	2N		
1.e.(1)		1.e.(3)		[Appendix B]		1.e.(1)		
[(25-1)	x	(1+ 0.10) + 2]	x	(4.200%)	/	50.00	=	2.39% /yr

c. Total Ownership Percent Per Year (DEPR + FCCM) = **5.99% /yr**

3. OWNERSHIP COSTS

a. Ownership per Year

		Total Ownership Percent Per Year		
[Plant Value	x	(DEPR + FCCM)		
1.a.(7)(a)		2.c.		
[$3,700,000	x	(5.99%)]	=	$221,630.00 /yr

b. Monthly Ownership Expense

(Ownership per Year	/	Months Available per Year)		
3.a.		1.d.(1)		
($221,630.00 /yr	/	9 months/yr)	rounded =	$24,626.00 /mo

Figure 4-2. Dredging Plant Ownership and Operating Rate Worksheet **Page 2 of 4**

Region 04

4. OPERATING COSTS

a. Fuel Cost

(1) Prime Engine Fuel

(Fuel Factor)		(HP)		(Fuel Cost per Gallon)		
1.e.(4)		1.a.(5)		1.b.(2)		
(0.045 gal/bhp-hr)	x	(3,730)	x	($2.50)	=	$419.63 /hr

(2) Secondary Engine Fuel

(Fuel Factor)		(HP)		(Fuel Cost per Gallon)		
1.e.(5)		1.a.(6)		1.b.(2)		
(0.039 gal/bhp-hr)	x	(2,475)	x	($2.50)	=	$241.31 /hr

(3) Total Fuel (Prime Engine Fuel + Secondary Engine Fuel) = $660.94 /hr

b. Water, Lube, and Supply (WLS) Cost

(1) Prime Engine WLS

(WLS Factor)		(Hourly Fuel Cost)		
1.e.(6)		4.a.(1)		
(0.22)	x	($419.63 /hr)	=	$92.32 /hr

(2) Secondary Engine WLS

(WLS Factor)		(Hourly Fuel Cost)		
1.e.(6)		4.a.(2)		
(0.22)	x	($241.31 /hr)	=	$53.09 /hr

(3) Total Fuel (Prime Engine WLS + Secondary Engine WLS) = $145.41 /hr

c. Repair Cost

(1) Economic Adjustment Factor (EAF)

(Economic Index for Present Year or Year of Use)		(Economic Index for Acquisition Year)		
1.c.(2)		1.c.(1)		
(7221)	/	(4438)	=	1.627

(2) Repair Cost

(Total Plant Value)		(RPR)		EAF		LAF		Life in Hrs		
1.a.(7)		1.e.(7)		4.c.(1)		1.b.(1)		1.e.(2)		
($3,700,000)	x	(1.30)	x	(1.627)	x	(1.08)	/	(130,000)	=	$65.01 /hr

Figure 4-2. Dredging Plant Ownership and Operating Rate Worksheet **Page 3 of 4**

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4. OPERATING COSTS (Continued)

d. Total Hourly Operating Cost (Fuel + WLS + Repairs)

(Fuel 4.a.(3)	+	WLS 4.b.(3)	+	Repairs) 4.c.(2)		
($660.94 /hr	+	$145.41 /hr	+	$65.01 /hr)	=	**$871.36 /hr**

e. Monthly Operating Cost

(Total Hourly Operating Cost) 4.d.	x	(Hrs Worked per Mo) 1.a.(8)		
($871.36 /hr)	x	(500 hrs/mo)	rounded =	$435,680.00 /mo

5. TOTAL MONTHLY RATE

a. Ownership (3.b.)	=	$24,626.00 /mo
b. Operating (4.e.)	=	$435,680.00 /mo
c. Total Estimated Additive Items (1.a.(9)):	=	$8,000.00 /mo
d. TOTAL MONTHLY RATE	=	**$468,306.00 /mo**

6. STANDYBY ALLOWANCE

a. Standard Hourly Standby Expense

(Monthly Ownership Expense 3.b.	/	Maximum hrs/mo = 30.4 days/mo x 24 hrs/day)		
($24,626.00 /mo	/	730 hrs/mo)	=	**$33.73 /hr**

b. Generator Fuel Allowance for Dredge *(An additional generator fuel allowance may be allowed under certain circumstances. This allowance is applicable to dredges only.)*

((Generator HP 1.a.(6)	/	Total Secondary HP) 1.a.	x	Secondary Fuel Cost) 4.a.(2)		
((200 hp	/	2,475 hp)	x	$241.31)	=	**$19.50 /hr**

c. TOTAL HOURLY STANDBY ALLOWANCE FOR DREDGE

(Standard Hourly Standby Expense 6.a.	+	Generator Fuel Allowance) 6.b.		
($33.73 /hr	+	$19.50 /hr)	=	**$53.23 /hr**

Figure 4-2. Dredging Plant Ownership and Operating Rate Worksheet **Page 4 of 4**